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# STUDIES ON THE CIRRIPIEDIAN FAUNA OF JAPAN. -VI. CIRRIPEDS FROM KYUSYU AND RYUKYU ISLANDS-

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# STUDIES ON THE CIRRIPEDIAN FAUNA OF JAPAN

## VI. CIRRIPEDS FROM KYUSYU

### AND RYUKYU ISLANDS\*

Huzio UTINOMI\*\*

With 6 Text-figures

#### Introduction

Our knowledge of the cirripedian fauna of the Kyusyu and Ryukyu Islands has been rather meagre and limited largely to deepwater forms. The littoral or intertidal forms have never been investigated. On two occasions of my visit to Kyusyu and neighbouring islands in 1936 and 1943, I collected littoral cirripeds at several places. I also examined collections of the same group stored in various museums and institutes in these districts.

The material dealt with in the present paper consists largely of the specimens obtained during these collecting trips, as well as those collected by the members of the Zoological Institute in the Kyusyu University and of the Amakusa Marine Biological Station on various occasions. Besides, by kindness of my friend biologists a number of specimens coming from the localities in those districts were entrusted to me for study. I wish to express my appreciation to these gentlemen and also to the Japan Society for the Promotion of Scientific Research for its financial aid in carrying out this work.

The following list gives the names of the species included in the present report together with their localities (those marked with an asterisk\* are commented upon in detail in the systematic account):

#### Family Scalpellidae PILSBRY

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\* Contributions from the Seto Marine Biological Laboratory, No. 123.

\*\* The author's name was formerly Fujio HIRO.

1. *Mitella mitella* (LINNÉ)

Kyusyu: Mozi; Hakata Bay, Hukuoka-ken (*mihi* '39). Okinosima, Korea Strait OHSHIMA '33). Tomioka, Amakusa Is.; Ibusuki, Iso, Kekura, Kagosima-ken (UTUNO '33). Yakusima and Tanegasima (TOKUDA and NAKAMURA '33; *mihi* '43). Ryukyu: Yaeyama Is. (IWASAKI).

2. *Calantica scorpio* (AURIVILLIUS)

Tomioka, Amakusa Is., on a hydroid *Dendrocoryne* sp. (HABE '42).

## Family Iblidae (LEACH) ANNANDALE

3. *Ibla cumingi* DARWIN

Tomioka, Amakusa Is. (Baba '38; *mihi* '43).

## Family Oxynaspidae NILSSON-CANTELL

4. *Oxynaspis pacifica* HIRO

Tomioka, Amakusa Is., on an antipatharian (IKEDA '31; BABA '33).

## Family Lepadidae (DARWIN) NILSSON-CANTELL

5. *Lepas anatifera* LINNÉ

Okinosima, Korea Strait (OHSHIMA '33). Saseho, on ships' bottoms MIYAKE '37). Tomioka, Amakusa Is. IKEDA '31; BABA '36; INAO '28). Kagosima Bay (*mihi* '43).

6. *Lepas anserifera* LINNÉ

Kyusyu: Tomioka, Amakusa Is., on a pumice-stone (BABA '33). Kazusa, Nagasaki-ken, on cuttle-fish bones (YAMAZAKI '34). Ryukyu: Daitô-zima, E. of Okinawa Is., on buoys (SUGIYAMA '31).

7. *Lepas pectinata* SPENGLER

Tomioka, Amakusa Is., on shells of *Janthina*, pumice-stones and floating woods BABA '38.

## Family Heteralepadidae NILSSON-CANTELL

8. *Heteralepas (Heteralepas) quadrata* (AURIVILLIUS)

Tomioka, Amakusa Is., on *Scyllarides haani* (INAO '28). Tomioka, on *Plagusia dentipes* (HIRAIWA '28; OHSHIMA '29; BABA '39). Tomioka, on *Panulirus japonicus* (IKEDA '29; Miyake '42).

9. \**Heteralepas (Paralepas) distincta* n. sp.

Tomioka, on buccal regions of *Panulirus japonicus* (IKEDA 5/V '29).

## Family Trilasmatidae NILSSON-CANTELL

10. *Trilasmis (Poecilasma) Kaempferi* (DARWIN)  
Tomioka, Amakusa Is., on *Macrocheira kaempferi* (OKABE '28).
11. *Trilasmis (Temnaspis) amygdalum* 'AURIVILLIUS)  
Tomioka, Amakusa Is., on mouth-parts of *Panulirus japonicus* (IKEDA '29; MIYAKE '42).

## Family Chthamalidae DARWIN

12. *Chthamalus challengeri* HOEK  
Kyusyu: Mozi; Hakata Bay, Hukuoka-ken (*mihi* '36). Beppu, Ooita-ken (*mihi* '36). Aosima, Miyazaki-ken (*mihi* '36). Okinosima, Korea Strait (OHSHIMA '33). Tomioka, Amakusa Is. (*mihi* '43). Kagosima (*mihi* '43). Yakusima and Tanegasima (NAKAMURA and TOKUDA '33; *mihi* '43). Ryukyu: Isigaki-zima, Yaéyama Is. (IWASAKI).
13. *Chthamalus Pilsbryi* HIRO  
Aosima, Miyazaki-ken (*mihi* '43). Tomioka, Amakusa Is. (*mihi* '43). Tanegasima (*mihi* '43).
14. \**Chthamalus intertextus* DARWIN  
Genka, west coast of Okinawa-zima (MIYADI '37). Benoki, west coast of Okinawa-zima (MIYAKE '37).
15. *Octomeris sulcata* NILSSON-CANTELL  
Kyusyu: Tomioka, Amakusa Is. (*mihi* '36). Izumi, Kagosima-ken, on *Balanus tintinnabulum volcano* (Kagosima Normal School). Aosima, Miyazaki-ken (*mihi* '43). Tanegasima (*mihi* '43). Ryukyu: Isigakizima, Yaéyama Is., on *Mitella mitella* and *Tetrachita squamosa japonica* (IWASAKI).

## Family Balanidae GRAY

16. *Balanus tintinnabulum volcano* PILSBRY  
Kyusyu: Aosima, Miyazaki-ken (*mihi* '43). Saseho, on ships' bottoms (MIYAKE '37). Izumi, Kagosima-ken (Kagosima Normal School). Yamakawa, Kagosima-ken (HABE '42). Ryukyu: Isigaki-zima, Yaéyama Is. (IWASAKI).
17. *Balanus tintinnabulum rosa* PILSBRY

- Kyusyu: Iki-sima, Korea Strait, on bamboo (TOKUDA '37). Saseho, on ships' bottoms (MIYAKE '37. Tomioka, Amakusa Is. (IKEDA '31; BABA '39; HABE '42). Izumi, Kagosima-ken (Kagosima Normal School). Aosima, Miyazaki-ken (*mihi* '43). Bungo Channel, on submerged ships (Kyusyu Univ., Zool. Inst.) Ryukyu: Daitô-zima, south of Okinawa Is., on buoys (SUGIYAMA '31). Iriomote-zima, Yaéyama Is. (OHSHIMA '33).
18. *Balanus amphitrite communis* DARWIN  
Tomioka, Amakusa Is. (MURAKAMI '42). Iriomote-zima, Yaéyama Is. (OHSHIMA '33).
19. *Balanus amphitrite albicostatus* PILSBRY  
Kyusyu; Mozi, Hakata Bay, Hukuoka-ken (*mihi* '36). Okinosima, Korea Strait (OHSHIMA '33). Beppu, Ooita-ken (*mihi* '36). Aosima, Miyazaki-ken (*mihi* '43). Ariake-kai, Saga-ken, on oyster farms (INUO '42). Misumi, Kumamoto-ken (*mihi* '36). Tomioka, Amakusa Is. (*mihi* '36; MURAKAMI '42). Yamakawa, Kagosima-ken (HABE '42). Ryukyu: Iriomote-zima, Yaéyama Is. (NAKAMURA '33). Isigaki-zima, Yaéyama Is. (MIYAKE '37).
20. *Balanus amphitrite hawaiiensis* BROCH  
Saseho, on ships' bottoms (MIYAKE '37).
21. *Balanus amphitrite krügeri* NILSSON-CANTELL  
Ariake-kai, Saga-ken, on oyster farms (INUO '42). Tomioka, Amakusa Is., on submerged plates (MIYAKE '42).
22. *Balanus amphitrite cirratus* DARWIN  
Iki-sima Korea Strait, on bamboo (TOKUDA '37). Misumi, Kumamoto-ken, on shells of a gastropod *Rapana thomasi* (*mihi* '36).
23. *Balanus amphitrite poecilotheca* KRÜGER  
Tomioka, Amakusa Is., on a hydroid *Dendrocoryne* sp. (KAWAMOTO '3; HABE '42). Tomioka, on a stem of a gorgonid *Acanthogorgia* sp. KAWAMOTO '32).
24. *Balanus trigonus* DARWIN  
Kyusyu: Iki-sima, Korea Strait, on bamboo (TOKUDA '37). Okinosima Korea Strait (OHSHIMA '33). Saseho, on ships' bottoms (MIYAKE '37). Tomioka, Amakusa Is. (*mihi* '43). Sakura-zima, Kagosima Bay (TOKUDA and NAKAMURA '33). Ryukyu: Daitô-zima, south of Okinawa Is. (SUGIYAMA '31). Iriomote-zima, Yaéyama Is. (OHSHIMA '33).
25. *Balanus socialis* HOEK  
Usibuka, Amakusa Is., on the carapace of *Limbrus validus* (IKEDA

- '32). Tomioka, Amakusa Is., on the carapace of *Lambrus validus* (BABA '33). Yamakawa, Kagosima-ken (HABE '42).
26. \**Balanus cepa* DARWIN  
Tomioka, Amakusa Is., on a solitary coral *Flabellum* (TAKENO).
27. \**Balanus allium* DARWIN  
Usibuka, Amakusa Is., on a stem of a coral *Dendrophyllia* sp. (IKEDA '32).
28. *Balanus calceolus* DARWIN  
Tomioka, Amakusa Is., on a gorgonid *Acanthogorgia* sp. (OHSHIMA '31; KAWAMOTO '32).
29. *Balanus cymbiformis* DARWIN  
Tomioka, Amakusa Is., on a gorgonid *Melitodes flabellifera* (BABA '38).
30. *Balanus granulatus* HIRO  
Tomioka Amakusa Is., on antipatharians (OHSHIMA '31; IKEDA '31; BABA '32; BABA '33).
31. *Acasta pectinipes* PILSBRY  
Tomioka, Amakusa Is., in sponges (BABA '33).
32. \**Acasta flexuosa* (NILSSON-CANTELL)  
Tomioka Amakusa Is., in a sponge (IKEDA '31).
33. *Acasta echinata* HIRO  
Tomioka, Amakusa Is., in the stalk of an alcyonarian *Dendronephthya* sp. (mihi '36).
34. *Creusia spinulosa* f. *eu-spinulosa* BROCH  
Takamatu near Tomioka, Amakusa Is., on *Goniopora* sp. (BABA '31).
35. \**Creusia spinulosa* f. *quarta* KOLOSVÁRY  
Tomioka, Amakusa Is., on *Oulastrea crispata* (mihi '43).
36. *Pyrgoma crenatum* SOWERBY  
Tomioka, Amakusa Is., on *Tridacophyllia lactuca* (mihi '43).
37. *Tetrachita squamosa japonica* PILSBRY  
Kyusyu : Karatu, Saga-ken (mihi '41). Iki-sima. Korea Strait (TOKUDA '37). Aosima, Miyazaki-ken (mihi '43), Tomioka. Amakusa Is. (mihi '36). Izumi, Kagosima-ken (Kagosima Normal School). Yamakawa, Kagosima-ken (HABE '42). Yakusima (TOKUDA and NAKAMURA '33. Tanegasima mihi '43). Ryukyu : Iriomote-zima, Yaeyama Is. (OHSHIMA '33). Isigaki-zima, Yaeyama Is. (IWASAKI).
38. *Tetrachita squamosa viridis* DARWIN  
Tanegasima (mihi '43).
39. *Tetrachita squamosa formosana* HIRO

- Tanegasima (*mihi* '43).
40. \**Tetrachita* (*Tetrachitella*) *chinensis* NILSSON-CANTELL  
Kyusyu: Aosima, Miyazaki-ken (*mihi* '43). Okinosima, Korea Strait (OHSHIMA '33). Tomioka, Amakusa Is. IKEDA '32; BABA '38). Yakushima TOKUDA and NAKAMURA '33). Ryukyu: Isigaki-zima, Yaeyama Is., on *Mitella mitella* (IWASAKI).
41. *Tetrachita* (*Tetrachitella*) *darwini* PILSBRY  
Aosima, Miyazaki-ken (*mihi* '43). Tomioka, Amakusa Is. (*mihi* '36).
42. *Chelonibia testudinaria* (LINNÉ)  
Hakata Bay, on the carapace of the loggerhead turtle *Caretta olivacea* (Kyusyu Univ., Zool. Inst.).

The majority of the cirrripeds heretofore recorded from Kyusyu and Ryukyu Islands are forms collected by dredging from deep waters. However, the thirty-three species comprising forty-two different forms, when subspecies and varieties are included, mentioned in the present paper are mainly shallow-water cirrripeds, occurring commonly in intertidal zones. They thus afford a favourable material for analyzing the faunistic feature of these districts in comparison with that of the neighboring regions.

A comparison of the littoral cirripedian fauna of Kyusyu and Ryukyu Islands with that of the south coast of Honsyu and also with that of Formosa, both explored by myself (HIRO 1937b, 1939), indicates that the cirripedian fauna is rather homogeneous throughout the coast of Japan apparently owing to the influence of the 'Kuroshio'. Most of the littoral cirrripeds found in this region belong to the Indopacific elements and have wide range of distribution both northward and southward.

Distribution of the representatives of littoral cirripeds  
in the region from Japan to Formosa.

Names of the species	Southern Honsyu	Kyusyu	Ryukyu Islands	Formosa
<i>Mitella mitella</i> LINNÉ)	+	+	+	rare
<i>Ibla cumingi</i> DARWIN	+	+	(+)	rare
<i>Chthamalus challenger</i> HOEK	+	+	+	—
<i>Ch. pilsbryi</i> HIRO	+	+	(+)	—
<i>Ch. intertextus</i> DARWIN	—	—	+	+
<i>Ch. malayensis</i> PILSBRY	—	—	(+)	+
<i>Ch. moro</i> PILSBRY	—	—	(+)	+
<i>Octomeris brunnea</i> DARWIN	rare	—	(+)	+
<i>Oct. sulcata</i> NILSSON-CANTELL	+	+	+	+
<i>Balanus tintinnabulum tintinnabulum</i> (L.)	—	—	—	+
<i>Bal. tint. occator</i> DARWIN	—	—	(+)	+
<i>Bal. tint. volcano</i> PILSBRY	+	+	+	—
<i>Bal. tint. rosa</i> PILSBRY	+	+	+	+
<i>Bal. amphitrite communis</i> DARWIN	+	+	+	+
<i>Bal. amph. albicostatus</i> PILSBRY	+	+	+	+
<i>Bal. amph. krügeri</i> NILSSON-CANTELL	+	+	(+)	+
<i>Bal. amph. hawaiiensis</i> BROCH	+	+	(+)	+
<i>Bal. amph. cirratus</i> DARWIN	+	+	(+)	+
<i>Tetracrita squamosa japonica</i> PILSBRY	+	+	+	—
<i>Tet. sq. viridis</i> DARWIN	+	+	(+)	+
<i>Tet. sq. formosana</i> HIRO	rare	+	(+)	+
<i>Tet. chinensis</i> NILSSON-CANTELL	+	+	+	+
<i>Tet. darwini</i> PILSBRY	+	+	+	+
<i>Tet. divisa</i> NILSSON-CANTELL	—	—	—	+

+ common; — absent; (+) probably present, though not included in the present collection.

As listed in the accompanying table, the species belonging to *Chthamalus* and *Octomeris* seem to show rather restricted distribution, as compared with the subspecies of *Balanus tintinnabulum*, *Balanus amphitrite* and *Tetracrita squamosa*. The three species of *Chthamalus* common in Formosan coasts are unknown in Japan proper, but they probably extend as far as to the Ryukyus.



*Chthamalus challenger* and *Ch. pilsbryi*, the true Japanese forms, on the other hand, are distributed south to the Ryukyus, but not to Formosa. *Octomeris brunnea* apparently belongs to the former category, while *O. sulcata* to the latter.

Of *Balanus tintinnabulum*, *B. amphitrite* and *Tetrachita squamosa* most of the subspecies are widely distributed from Japan to Formosa, and show local variation more or less in density. A few, such as *B. tintinnabulum tintinnabulum*, *B. tint. occator* and *B. amphitrite cirratus*, however, are more limited in distribution. As a good example of the transition of distributional center we may reckon the three subspecies of *Tetrachita squamosa* (viz. *viridis*, *formosana* and *japonica*). Subsp. *japonica* is entirely missing in Formosa, but both *viridis* and *formosana* are prevalent. In Japan proper, however, *japonica* is predominant, and both *viridis* and *formosana* are found only along the southern Pacific coast, though the last-named one is very scantily represented at Seto, Wakayama-ken. At Yaku-sima and Tanega-sima islands, south of Kyusyu, *viridis* is dominant, but both *formosana* and *japonica* are rather poorly represented.

Anyhow, the Ryukyu Islands present a mixed feature of the tropical and temperate forms of the littoral cirripedian fauna. It is also evident that a wide gap between Tanega-sima and Amami-ôshima interrupts or controls the extension of distributional range of both the tropical and temperate forms. Thus the 'Wata-se-Line', recognized by Japanese zoogeographers as limiting the distribution of land animals, seems valid for littoral animals as well.

### Some Systematic Accounts

#### *Heteralepas (Paralepas) distincta* n. sp.

(Figs. 1 & 2c, d)

The present species which seems to be new to science is represented by three large specimens attached to the buccal region of the spiny lobster *Panulirus japonicus*, together with many small specimens of *Heteralepas (Heteralepas) quadrata*. So I at first took them to belong to the latter species. Yet they distinctly differ from this in its internal structure.

Capitulum almost globular, a little compressed laterally near orifice, from which a slight dorsal keel runs downwards along carinal side. Orifice provided with puckered lips, small, not protuberant, less than one-fourth as long as capitulum. Integument yellowish in preserved condition, somewhat thick, but not hard; its surface smooth or finely wrinkled transversely, probably owing to the condition of preservation. Scuta apparently absent, leaving the

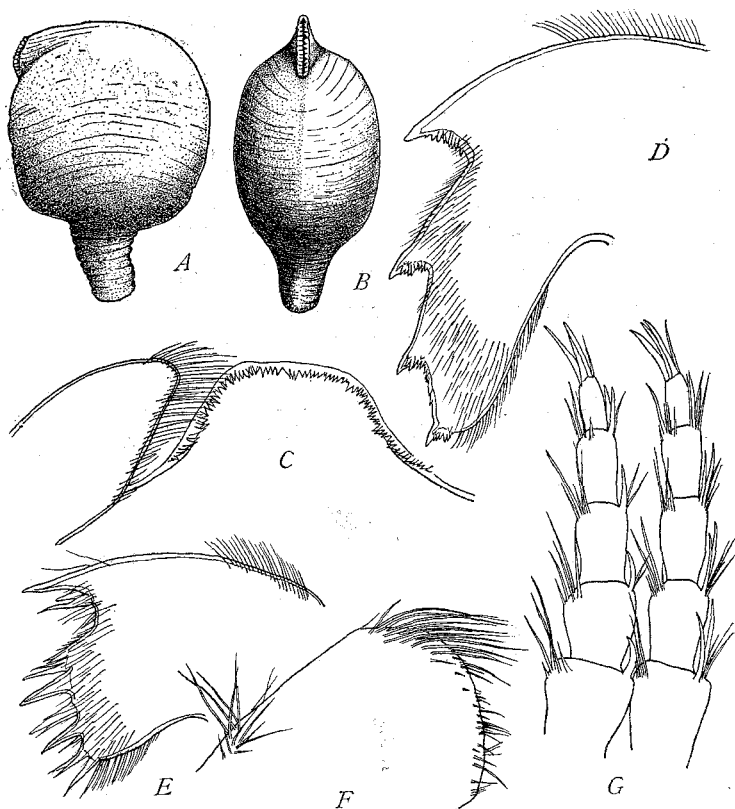


Fig. 1. *Heteralepas* (*Paralepas*) *distincta* n. sp. A, animal side view  $\times 3$ ; B, the same in occludent view  $\times 3$ ; C, labrum and palpus  $\times 40$ ; D, mandible  $\times 50$ ; E, maxilla I  $\times 50$ ; F, maxilla II  $\times 40$ ; G, distal part of cirrus V  $\times 60$ .

trace of adductor muscle as a white patch below orifice. Peduncle very short, about one-third as long as capitulum, slender, coarsely wrinkled, and sharply defined from capitulum.

Mouth-parts: Labrum with closely-set sharp denticles. Palpus conical, with bristles along inner margin. Mandible with three teeth and a lower angle; all projections comparatively short and prominently pectinated inferiorly. Maxilla I with a notch rather wide for the subgenus *Paralepas* present below a strong and two smaller upper spines; frontal edge below notch slightly protruded and armed with spines of different sizes, two of which are particularly

much stouter than others. Maxilla II with a continuous row of short bristles along frontal edge and a sparse set of bristles on proximal end of upper edge.

Internal body very plump, globular, and bears on each side a well-developed filamentary appendage about two-thirds as long as cirrus I at base of the latter. Cirri with rather feebly developed rami, composed of a few segments, of subequal length except the first one. Protopodite of each cirrus generally long, much broadened downwards. Both rami not curled, about as long as protopodite. In anterior rami of cirri V and VI, five to eight distal segments provided each with two strong dorsal bristles, a feature typical of the subgenus *Paralepas*. Caudal appendage 7- or 8-segmented, slender, a little longer than protopodite of cirrus VI. Numbers of segments in all cirri are as follows:

I	II	III	IV	V	VI
9 8	13 14	14 15	13 14	14 13	14 11

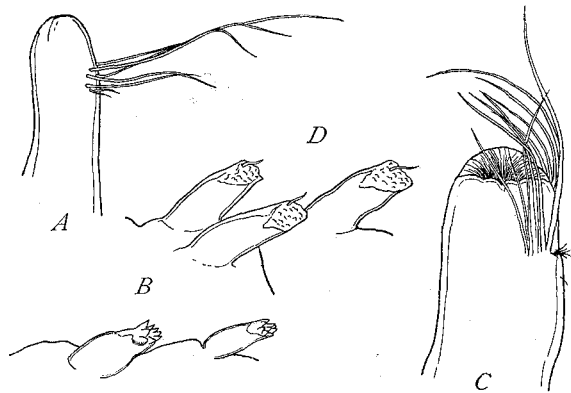


Fig. 2. *Heteralepas* (*Heteralepas*) *quadrata* (AURIVILLIUS) [A, B] and *Heteralepas* (*Paralepas*) *distincta* n. sp. [C, D]. A, C, end of penis  $\times 100$  (A)  $\times 90$  (C); B, D, rivet-like appendages of penis  $\times 300$ .

Penis very stout, a little longer than cirrus VI, distinctly annulated and has a peculiar armature. Each ring is beset with a transverse row of rivet-like peculiar appendages, recalling those of *Heteralepas* (*Heteralepas*) *quadrata* (AURIVILLIUS) and *H. (Paralepas) lithotryae* HOEK. The tip of each appendage is somewhat truncated, rugged, and provided with a short sensory hair. In the above two species, the tip is more rugged, being provided with distinct tubercles and

lacking any hair. Moreover, a few long bristles directed towards the base are scattered all over the surface. The extremity is abruptly tapering, without annulations, and bears two tufts of long bristles distally near the end.

*Measurements of largest specimen in mm* : Length of capitulum 11, breadth 11, diameter 8 ; length of peduncle 4.5, diameter 4 ; length of orifice 2.5.

### *Chthamalus intertextus* DARWIN

It is of interest to find that only this species among all the Formosan *Chthamalus*-species is spread into the Okinawa Islands. This barnacle is characterized by the depressed, extremely corroded walls and by the beautiful violet colour inside the wall. The opercular valves on each side are firmly calcified together, remaining only a trace of suture in the lower half of the interior.

### *Balanus cepa* DARWIN

For synonymy see NILSSON-CANTELL, 1938, p. 52.

Some small dry specimens of *Balanus*, attached to a solitary deepsea coral *Flabellum* sp. from Tomioka, agree fairly well with *Balanus fujiiyama* ANNANDALE, which I have described on specimens attached to *Pinctada maxima* coming from the neighborhood of Port Darwin, N. W. Australia (HIRO, 1936). This species, however, was found as synonymous with *Balanus cepa* DARWIN by NILSSON-CANTELL (1938) who examined ANNANDALE's type specimens of *B. fujiiyama*. Brief descriptions based on the present material follow : —

Shell steeply conical, distinctly ribbed longitudinally on lower half and coloured dull reddish-purple on summits of compartments. Orifice small, about 1.2 mm in diameter, ovate in outline. Radii very narrow, hardly distinguishable, their sutural edges being septate though not strongly. Base flat, with radial lines interiorly.

Scutum finely striated longitudinally ; pit for depressor muscle distinct, adductor ridge moderately prominent, articular ridge evenly arched and long. Tergum with straight scutal margin and pointed apex, though not beaked ; externally flat, entirely lacking spur-fasciole ; spur broad, as long as one-half its width, its scutal margin being one-half as long as basal margin and oblique to scutal margin of valve ; no crest for depressor muscles.

*Measurements in mm* :

Carino-rostral diameter	6.5	5.5
Height	4.2	4.0

This species was first described by DARWIN from Japan, and later recorded by PILSBRY (1916) from Mogi, Nagasaki-ken, not far from the locality of the present specimen.

*Balanus allium* DARWIN

(Fig. 3)

*Balanus allium*, DARWIN, 1854, p. 281; PILSBRY, 1916, p. 228; BROCH, 1922, p. 325.

*Acasta madreporicola*, BROCH, 1922, p. 333.

?*Balanus arcuatus*, HOEK, 1913, p. 210; PILSBRY, 1916, p. 228; NILSSON-CANETLL, 1921, p. 337; BROCH, 1931, p. 78; NILSSON-CANETLL, 1938, p. 52.

The specimens found attached to the coral *Dendrophyllia* taken from Usibuka seem to correspond fairly with *Balanus allium* DARWIN, especially in the shape of the tergum.

Shell steeply conical, somewhat compressed laterally, coloured pale pinkish purple or white all over, and strongly ribbed longitudinally; the ridges are closely placed to one another, connected with the corresponding ridges over the surface of basal cup, and sometimes transversely striated or beaded. Parietal area of carinal latus extremely narrow, with a single ridge and sometimes obliterated, only leaving behind broad ala and radius, as shown in BROCH's figure of *Acasta madreporicola*. Radii broad, with horizontal summits, and finely striated transversely. Interior of parietes strongly ribbed longitudinally, provided with prominent septate sutural edges. Whole shell sometimes covered entirely or in part by thin calcareous layer originated from the coral, so that all radii may be obliterated.

Base flat or somewhat hollowed out, being partially imbedded in coral, but without forming any regular cup-like shape; externally furnished with prominent ridges continued from those of compartments, and internally with delicate radial ridges.

Scutum with closely-set, very feebly crenated growth-lines and covered all over by yellowish cuticle which is hairy along growth-lines. Articular ridge very prominent, evenly arched and projecting beyond tergal margin. A deep pit for lateral depressor muscle present. Adductor ridge scarcely defined, though pit for adductor muscle is rather distinct.

Tergum very broad, flat and covered externally with yellowish cuticle, which is hairy along growth-lines as in scutum. Growth-lines smooth,

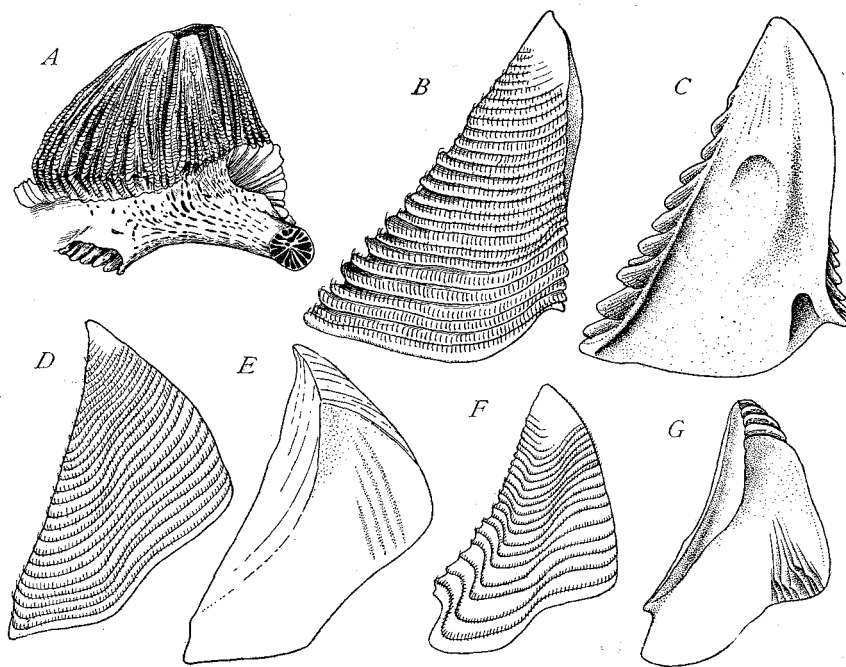


Fig. 3. *Balanus allium* DARWIN. *A*, animal in side view  $\times 3$ ; *B*, outer side of scutum  $\times 15$ ; *C*, inner side of scutum  $\times 15$ ; *D*, outer side of tergum  $\times 15$ ; *E*, inner side of tergum  $\times 15$ ; *F*, outer side of tergum of forma *truncatus* nov.  $\times 8$ ; *G*, inner side of tergum of forma *truncatus* nov.  $\times 8$ .

closely-set. Apex pointed, but not beaked, scutal margin almost straight. Spur about one-half as wide as basal margin, or even a little wider, and very short, less than one-half of its own width; its scutal margin nearly confluent with basiscutal angle of valve. Internally, articular ridge very low, articular furrow broad and almost flat; crests for depressor muscles very feeble, and 4 to 6 in number.

The internal parts could not be examined, as the specimens were dried.

*Remarks:* As clear from the above description and figures, the present specimens seem to be typical for this species. Several specimens on *Dendrophyllia micranthus* from Tanabe Bay, middle Honsyu, also agree with DARWIN's original description, and I have no doubt that they belong to the same species.

The closely allied species, *Balanus arcuatus*, according to HOEK (1913), is distinct from *B. allium* in the peculiarity of the arcuated shape of the tergum. As to the affinity of *Acasta madreporicola* having a broad spur, BROCH (1931) considers it to be 'only an extreme variant of *B. arcuatus* determined by special biological conditions'. On comparison with his figure, however, *Acasta madreporicola* appears to be more like *B. arcuatus*, as its tergum is very broad, and not so beaked at the apex.

*Forma truncatus* (nov.) — A lot of specimens on *Dendrophyllia arbuscula* from Tanabe Bay before me contain an unique example having the following peculiarities: — The external appearance of the shell and scutum agrees very well with the above description for the typical form of *B. allium*. The tergum, however, is peculiar in showing growth-lines rather more widely separated from one another and a less-pointed apex. The spur is distinctly defined from the basal margin of the valve, as it is about one-half as wide as the basal margin, a little longer than one-half of its own width and has a truncated end; its scutal margin is quite separate from the basiscutal angle and parallel with the almost straight scutal margin of the valve. Crests for the depressor muscles are very prominent and more numerous than in the typical form. It measures about 12 mm in carino-rostral diameter and 5 mm in height.

It is probable that the shape of the tergum is highly variable in this species, and thus of little use for specific differentiation. *Balanus arcuatus* HOEK may well be regarded as an extreme variant or subspecies of *B. allium*, not as a separate species. HOEK (1913 and PILSBRY (1916) also have expressed their doubt as to the validity of the species. Likewise, the validity of *B. fujiiyamaformis* recently described by KOLOSVÁRY (1947b) from Singapore may be questioned. This form is apparently more akin to *B. allium* f. *truncatus* than to *B. fujiiyama* which is synonymous with *B. cepa*.

### *Acasta flexuosa* (NILSSON-CANTELL)

This sponge-inhabiting barnacle was first described by me (HIRO 1931) from Amakusa under the name of *Acasta amakusana* n. sp. Later, however, it was found as synonymous with *Pseudoacasta* (?) *flexuosa* NILSSON-CANTELL (1931) described a few months before from an unknown locality of Japan. The structure of the specimens from Amakusa agrees with my full description based on the specimens from Seto (HIRO 1937b), so that there is nothing to be added to it.

### *Acasta echinata* HIRO

(Figs. 4 & 5)

This species was first described by me on specimens imbedded in the

stalk tissue of an aleyonarian *Dendronephthya* collected at Tomioka, Kyusyu (HIRO 1937a). Very recently, BROCH (1947) rediscovered it at Condor Is., Indo-chinese coast, and described in details, so that no further comment seems necessary. He mentions some differences between his specimens and mine; but all of the alleged differences seem to me of little systematic value.

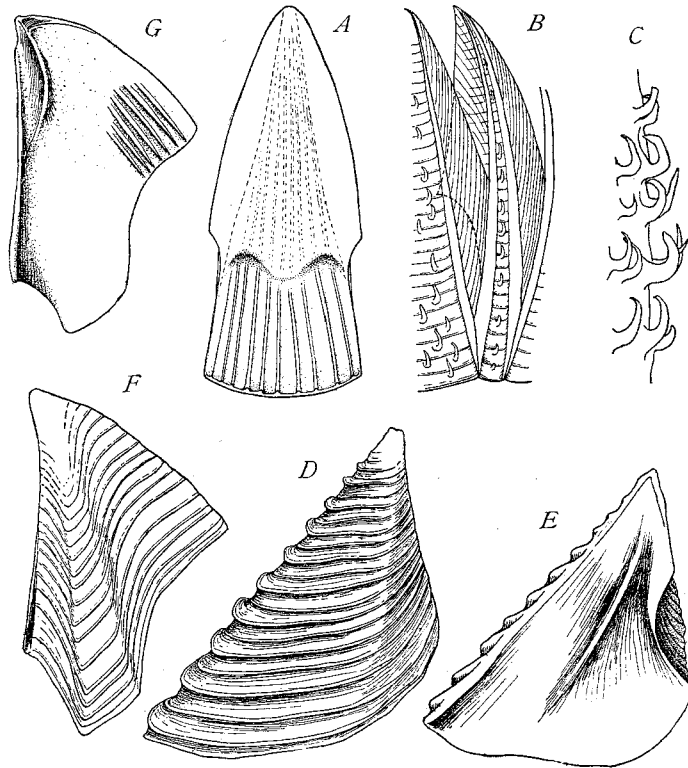


Fig. 4 *Acasta echinata* HIRO. A, inner side of carina  $\times 5$ ; B, outer side of carinolateral compartment and its neighbourings  $\times 5$ ; C, hook-like spines on compartments  $\times 15$ ; D, outer side of scutum  $\times 8$ ; E, inner side of scutum (from other specimen)  $\times 8$ ; F, outer side of tergum  $\times 8$ ; G, inner side of tergum  $\times 8$

The scutum is usually a little wider than high, but sometimes as wide as high, as shown in Fig. 4E. Likewise, the sculpture of the inner side of the opercular valves is, as he noticed, subject to rather considerable variation, the



adductor ridge and crests or pits for depressor muscles being either distinct or faint in different specimens. The same is also true for the mouth-parts and cirri.

Of the mouth-parts, the labrum has a minute tooth on each side of the median deep notch, but it may be missing. Mandible has always five teeth but its fourth tooth is usually bifid as in the second to third, and sometimes obtusely pointed.

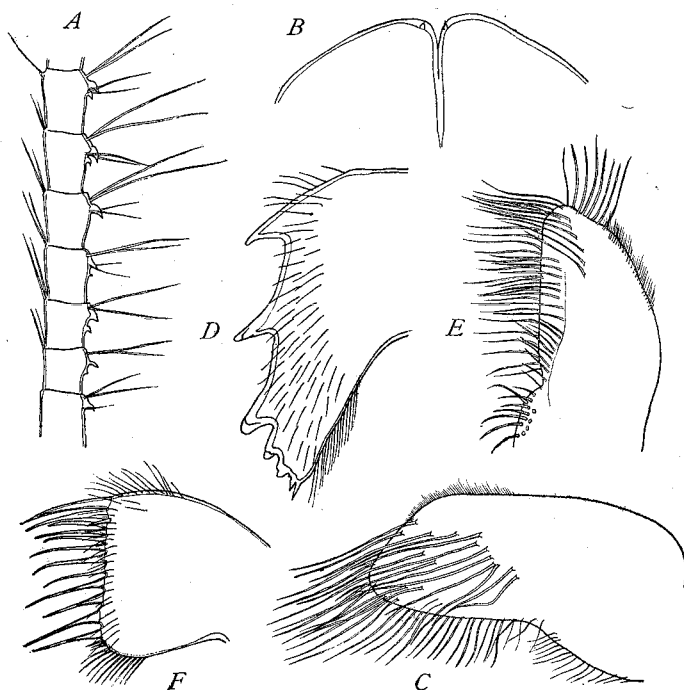


Fig. 5. *Acasta echinata* HIRO. A, lower segments of anterior ramus of cirrus IV  $\times 40$ ; B, labrum  $\times 40$ ; C, palpus  $\times 40$ ; D, mandible  $\times 40$ ; E, maxilla II  $\times 40$ ; F, maxilla I  $\times 40$ .

In cirri I-III, the anterior ramus is longer than the posterior. In the remaining posterior cirri, the rami are subequal in length and bear 2 or 3 ventral bristles on each segment. In cirrus IV, the lower half of the anterior ramus bears 1 or 2 hook-like teeth on each segment and the distal half of the posterior ramus has only one tooth. The numbers of segments in the cirri are as follows:

I	II	III	IV	V	VI
15	7	10	8	12	10
				12	23
				?	?
				?	?

Penis is finely annulated all over and about twice as long as cirrus VI;  
no basidorsal point is present.

Measurements in mm :

Carino-rostral diameter	7	6.5
Height	11	10

*Creusia spinulosa* f. *quarta* KOLOSÁRY

(Fig. 6)

*Creusia spinulosa* var. 4, DARWIN, 1854, p. 378.

*Creusia spinulosa* forma *quarta*, KOLOSÁRY, 1947a, p. 426.

Shell flat, with many prominent radiating ridges : base somewhat cylindric. Scutum not much elongated transversely, basal margin being a little longer than tergal margin; basitergal corner evenly curved, articular ridge long and rather high, adductor ridge prominent, not extending down to the base. Tergum similar to DARWIN'S Pl. XIV, Fig. 6i; spur well defined from basal margin of valve, square in outline, being about as high as broad, and about one-third as broad as basal margin of valve; spur-fasciole distinct.

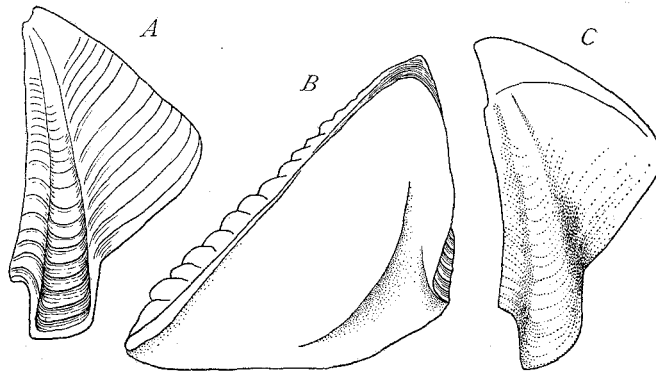


Fig. 6. *Creusia spinulosa* f. *quarta* KOLOSÁRY. A, outer side of tergum  $\times 20$ ; B, inner side of scutum  $\times 20$ ; C, inner side of tergum  $\times 20$ .

According to DARWIN, the shape of the tergum is highly variable, the spur being sometimes more or less narrow and pointed, and thus producing a closed spur-furrow. However, I have not met with such an extreme variant.

*Tetrachita* (*Tetrachitella*) *chinensis* NILSSON-CANTELL

*Tetrachita purpurascens chinensis*, NILSSON-CANTELL, 1921, p. 359; HIRO, 1939, p. 273.

*Tetrachita purpurascens nipponensis*, HIRO, 1931, p. 155; HIRO, 1937b, p. 469.

As I have mentioned on the specimens from Formosa (HIRO 1939), this cirriped is characterized by the six large apertures formed on the wall, two apertures in carina and rostrum and one in lateral compartments\*. Such perforated state is very common in older specimens, though not found in small or younger ones. The shell is generally dusky white owing to its hypobiotic habitat, and provided with a few or numerous prominent radial ridges.

Through the courtesy of Dr. Melbourne WARD who was in charge of the Australian Museum at Sydney, I have been able to examine Australian specimens of the typical *Tetrachita purpurascens* (WOOD) and compared them with the Oriental specimens. The Australian *purpurascens* has no indication of such apertures. Furthermore, the shell is rather thicker and attains to a larger size, measuring about 25 mm in diameter, and its surface is purplish in colour and deeply eroded or granulated. The Oriental form, on the contrary, is pale in colour and smaller in size, not growing over 15 mm in diameter. More interesting and significant is the ecological evidence that the Oriental form is usually found attached to the underside of stones or to *Mitella mitella* and other littoral barnacles or shells, and when such stones are accidentally overturned, the barnacles attached to the underside are apt to suffer death.

The opercular valves are not much different from those in the Australian form. However, the scutum has a longitudinal medial furrow on the outer surface, and the basal margin is hollowed out at the end of the furrow. On these grounds, it seems better to regard the Oriental form as a separate species, distinct from the Australian form which is the type of *Tetrachita purpurascens*.

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\* A wrong number of apertures formed on the wall is given in my previous paper (HIRO 1939, p. 274).

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